Bedford 60/70 Diesel Engines

Service Information

TS. 807

BEDFORD

60/70 DIESEL ENGINES

SERVICE INFORMATION

SERVICE

VAUXHALL MOTORS LTD.

LUTON · ENGLAND

© COPYRIGHT SEPTEMBER 1966

TS. 807

CONTENTS

ENGINE 3

FUEL SYSTEM 22

RECOMMENDED LUBRICANTS.. 33

RITEWAY SERVICE TOOLS.. 35

ENGINE

DESCRIPTION	3
FAN BELTS	5
JOCKEY PULLEY	6
WATER PUMP	7
CYLINDER HEAD AND VALVES	8
CRANKSHAFT PULLEY AND TIMING CASE	9
TIMING GEARS	10
CRANKCASE FRONT PLATE	13
OIL PUMP	14
AIR COMPRESSOR OR EXHAUSTER	15
PISTONS AND CONNECTING RODS	15
CRANKSHAFT AND BEARINGS	16
FLYWHEEL	16
SPECIFICATIONS	17

DESCRIPTION

The Bedford 60 engine (381 cu. in.) and 70 engine (466 cu. in.) are direct-injection six-cylinder diesel units of 4.125 and 4.562 in. bore respectively, both having a stroke of 4.75 in.

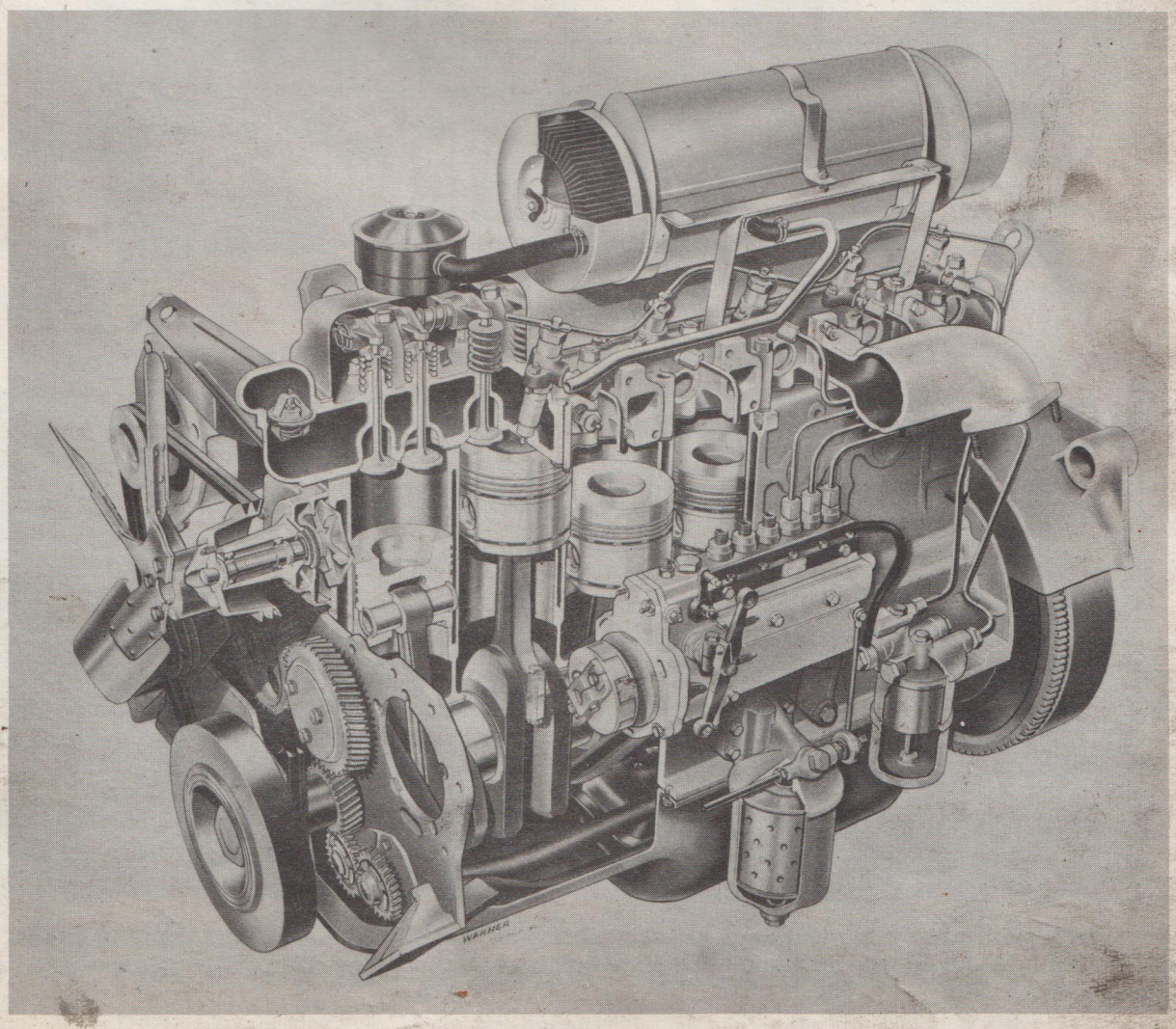


Fig. 1. 70 engine assembly. The compressor is omitted for clarity of illustration

33848

All major parts, except the cylinder block and pistons, flywheel and clutch, and the fuel injection equipment, are common to both engines.

Difference between these engines and the smaller Bedford diesels, affecting servicing procedure are :

(a) The cylinder block is 1.00 in. thick at the top deck to give adequate support for the cylinder head studs, which are arranged so that six encircle each bore, almost equally spaced, to give maximum gas seal. Dry-seal end-to-end water flow is retained.

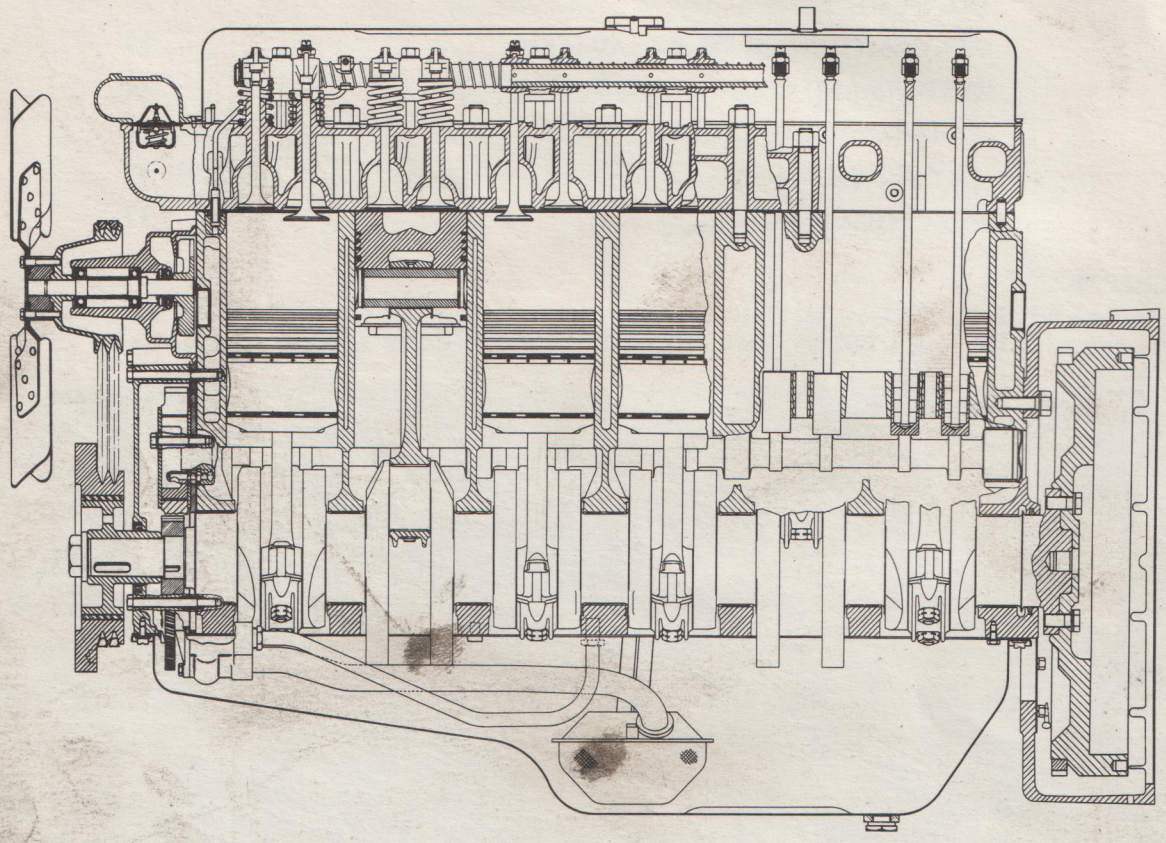


Fig.2. Engine details - longitudinal

(b) The pistons operate direct in the liner-less cylinder block.

(c) All journals and crankpins of the seven bearing crankshaft are induction hardened.

(d) Both the intake and exhaust valves are aluminized, and operate in guides integral with the cylinder head.

(e) The engine oil pump is of the internal rotor type, and is driven from the crankshaft timing gear through an idler.

(f) To accommodate the Borg and Beck 14AS or 15AS clutch, a 'pot' type flywheel is used in a circular housing bolted to the crankcase.

(g) The twin-belt water pump pulley is pressed direct on to the pump shaft. The pump is bolted direct to the cylinder block, no pump back plate being used. Belt tensioning is by a screw adjusted jockey pulley.

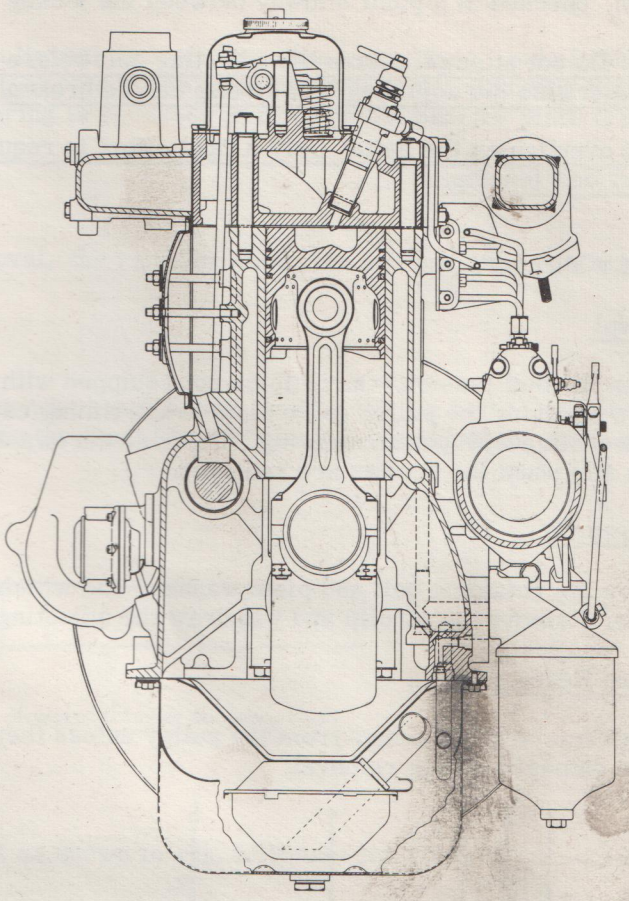


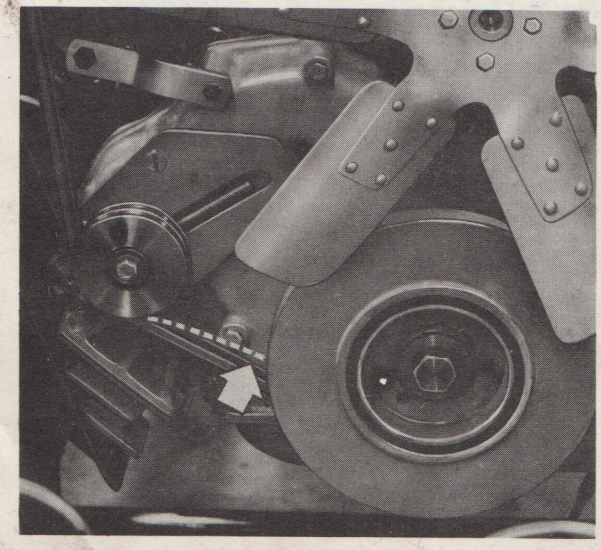
Fig.3. Engine details - transverse

FAN BELTS

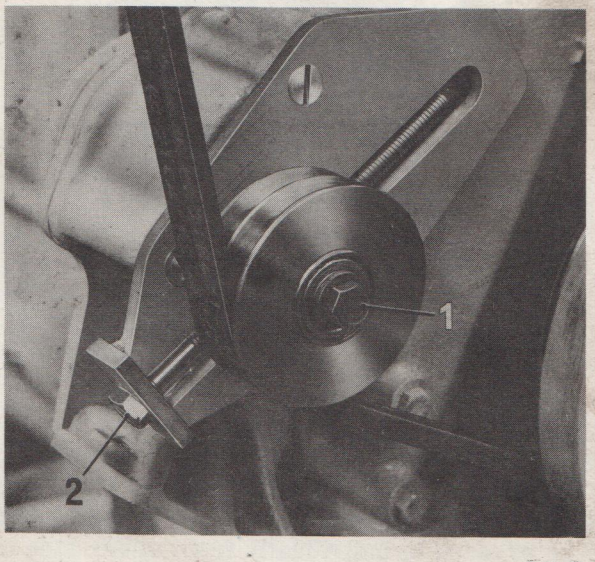
Fan belts are serviced in matched pairs to ensure even tension on both belts. Therefore if one belt should fail it is essential that both belts are renewed and the remaining belt discarded.

Adjustment

Access to the jockey pulley for belt adjustment **can** be gained from underneath the vehicle (Fig. 4).



S 3066



S 3067

Fig.4. Left: Fan belt tension check point. See page 21 for belt tension data.
Right: The retaining bolt (1) must be slackened before turning the adjusting bolt (2)

Slacken the retaining bolt one complete turn and turn the adjusting bolt to obtain the specified belt tension, checked at a point midway between the jockey and crankshaft pulleys.

NOTE: Do not attempt to turn the adjusting bolt before slackening the retaining bolt one complete turn otherwise the adjusting bolt circlip can be broken.

Do not overtighten the belts. Only a light effort is required on the adjusting bolt to obtain the correct belt tension.

JOCKEY PULLEY

Removal

Slacken the belt tension. On vehicles not equipped with power steering, remove the three nuts and screws securing the pulley guide plate to the timing cover and withdraw the pulley assembly. On vehicles fitted with power steering, the three screws engage the power steering pump which can be left in situ when the screws are removed.

Disassembly

Remove the retaining bolt and plain washer, and withdraw the pulley and the bearing plate from the spindle. Remove the circlip and withdraw the adjusting bolt from the guide plate.

Bearing Renewal

Do not remove the bearings from the pulley unless they are to be renewed as one of the bearings will be damaged during removal.

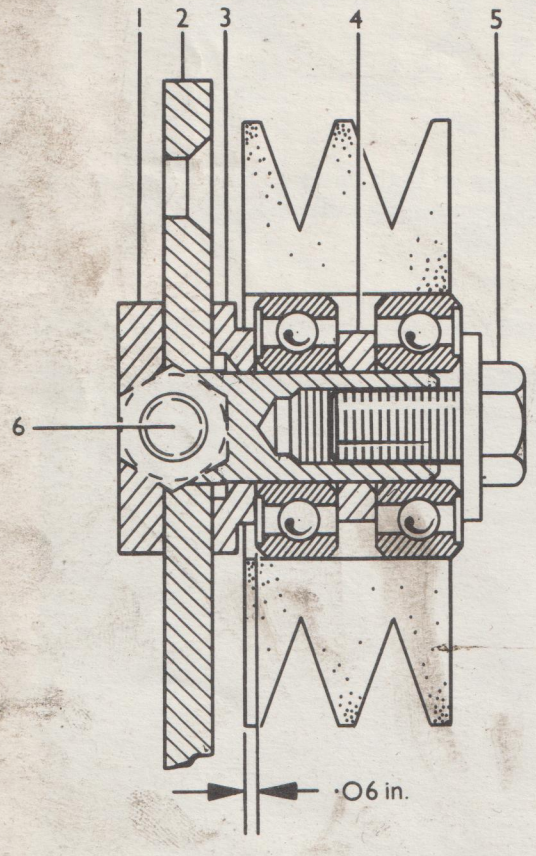


Fig.5. Jockey pulley details. 1. Spindle. 2. Guide plate 3. Bearing plate 4. Spacer 5. Retaining bolt 6. Adjusting bolt. The bearings must be pressed into the pulley to the location shown

Press the bearings and spacer out of the pulley. New bearings are pre-packed with grease and must be pressed in individually from either side of the pulley (applying pressure to the inner and outer races) so that they are located as shown in Fig. 5 and the spacer is clamped by the inner races. Make sure that the shielded side of each bearing is on the outside.

Reassembly

Assemble the adjusting bolt with a new circlip and the spindle to the guide plate, and place the bearing plate on the spindle so that the slotted side of the plate is towards the adjusting bolt. Install the pulley so that the side on which the bearing is recessed is towards the bearing plate (Fig. 5).

WATER PUMP

To gain access to the water pump for removal, the radiator cowl, fan and radiator should be removed.

Disassembly

Withdraw the pulley using a flange type drag which can be attached by the fan bolts. Remove the rotor with a claw-type drag. After removing the front bearing circlip, press out the shaft and bearings from rear to front.

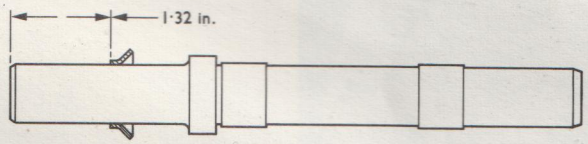


Fig.6. Location of water thrower on pump shaft

Inspection and Reconditioning

When renewing the water thrower, locate it as shown in Fig. 6. Renew the rotor if the seal contact face is worn.

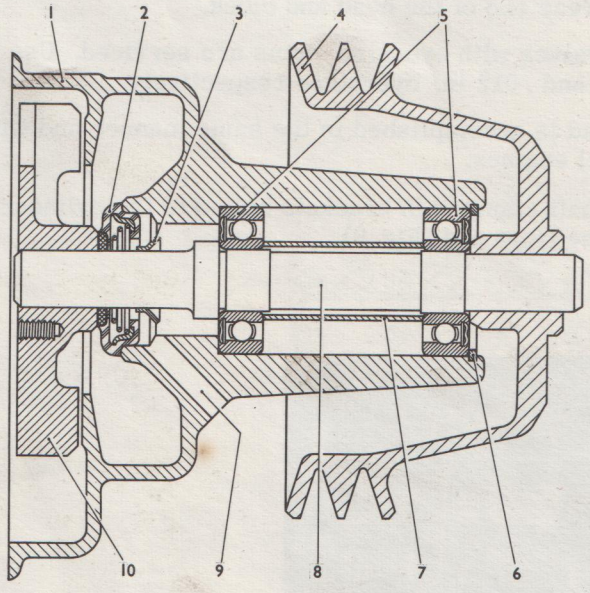


Fig.7. Water pump details
1. Pump body
2. Water seal
3. Water thrower
4. Pulley
5. Shaft bearings
6. Circlip
7. Bearing distance piece
8. Pump shaft
9. Ventilation hole
10. Rotor

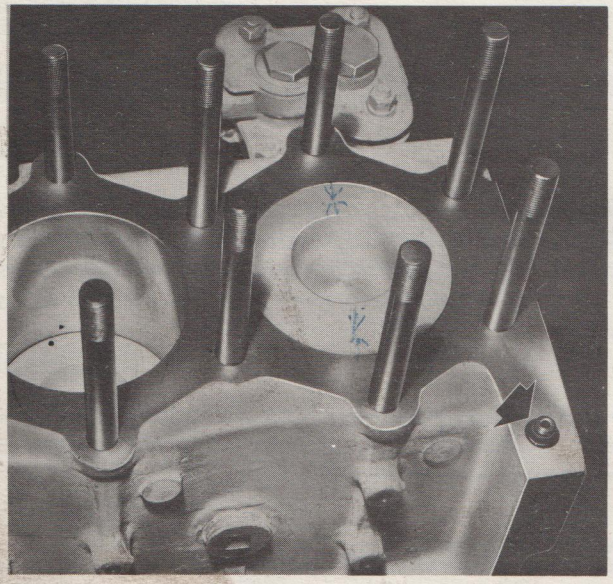
Reassembly

Pack the bearings with recommended grease and install them so that the shielded sides are away from each other. Before installing the distance piece and front bearing, half fill the space between the bearings with recommended grease. Press home the pulley until it contacts the front bearing.

Smear the water seal face and the locating recess in the pump body with recommended grease. Press on the rotor so that the end of the shaft is . 007 to . 010 in. proud of the rotor rear face.

Installation

Renew the gasket, also the copper washers on the pump bolts. Adjust the fan belts to correct tension (page 5).



S 3068

Fig.8. Oil supply to the rockers is fed via a tubular dowel (arrowed). A neoprene seal surrounds the dowel

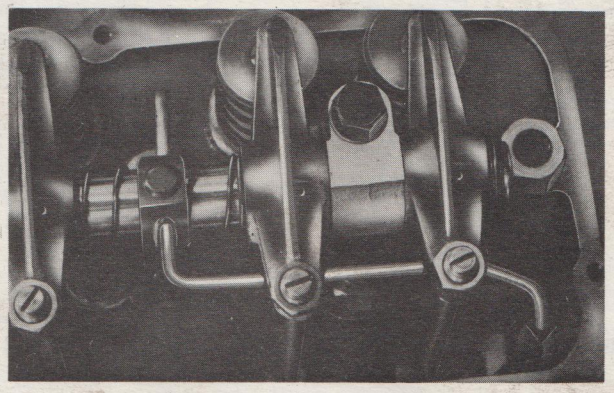
CYLINDER HEAD AND VALVES

The cylinder head is secured by twenty six studs and nuts and has a laminated steel gasket. Two dowels locate the head, the front dowel which is drilled (Fig. 8), also communicates with the rocker oil feed drilling in the cylinder block and head. A neoprene seal surrounds the dowel. Neoprene seals are also fitted to the two water ways at the rear end of the head and block.

The valve guides are integral with the head, and valves with oversize stems are serviced. Use Reamers Z8500, Z8501 and Z8502 for .003, .006 and .012 in. oversizes respectively.

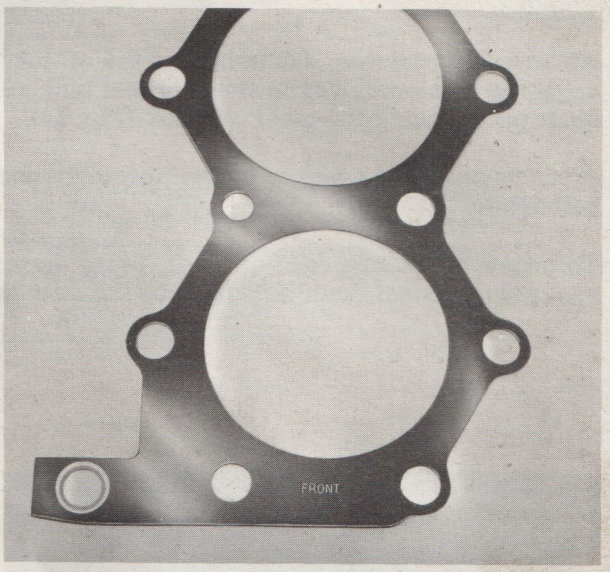
Renewal of the injector sleeves in the cylinder head is accomplished in the same manner and with the same tools as used for previous Bedford diesel engines.

The rockers are bushed and operate on a single shaft clamped in brackets bolted to the cylinder head, the oil feed pipe is located in a drilling at the front end (Fig. 9).



S 3069

Fig.9. Rocker oil feed pipe. The front end engages a drilling in the cylinder head



S 3070

Fig. 10. The front end of the cylinder head gasket is appropriately marked

When installing the cylinder head, tighten the cylinder head nuts tc the specified torque in the sequence shown in Fig. 11.

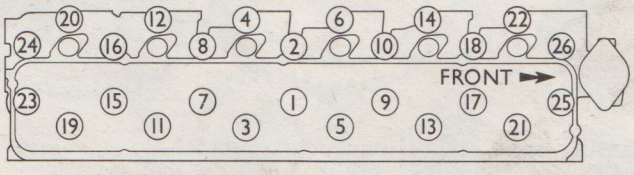


Fig. 11. Cylinder head nut tightening sequence diagram

CRANKSHAFT PULLEY AND TIMING CASE

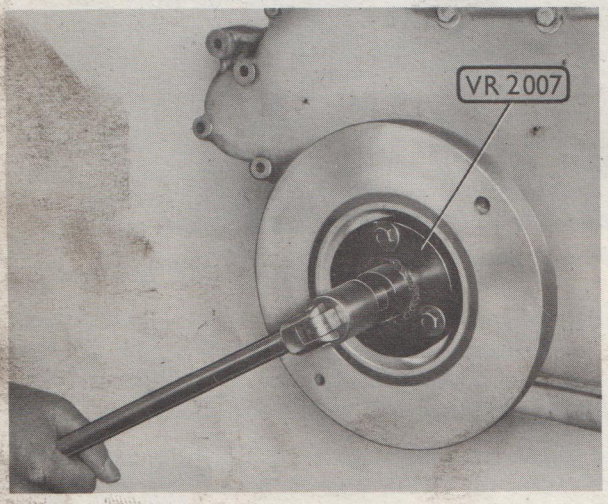
The pulley is an interference fit on the crankshaft spigot, and the timing cover is located by two dowels pressed into the front of the crankcase.

Removal

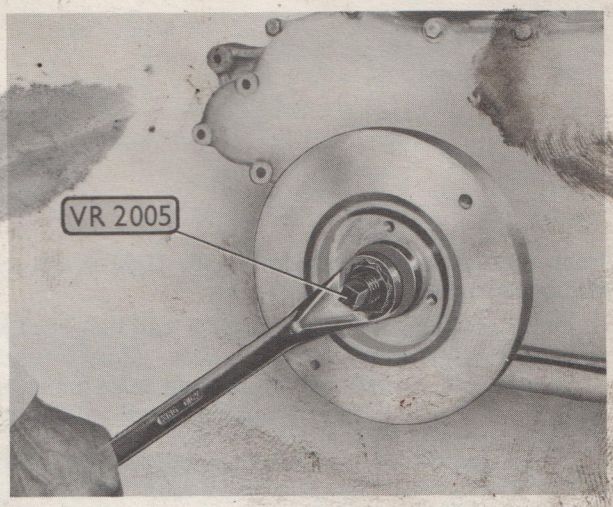
Remove the radiator, fan belts and the oil pan. When removing the pulley bolt, lock the engine by engaging a screwdriver in the flywheel ring gear through the timing aperture. Withdraw the crankshaft pulley using Remover VR2007 (Fig. 12).

After removing the jockey pulley assembly and the securing bolts and nuts the timing case can be withdrawn.

To renew the timing case oil seal, drive the seal out from inside the case and press home the new seal using a steel disc. Ensure that the seal lip is towards the inside of the case.



S 3071



S 3072

Fig. 12. Removing and installing the crankshaft pulley and vibration damper

Installation

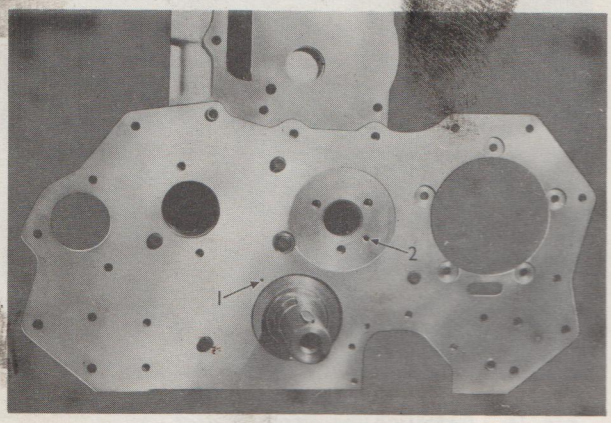
Use new gaskets for the timing case and oil pan.

Install the crankshaft pulley, using Installer VR2005 (Fig. 12) and tighten the pulley bolt to the specified torque.

Tighten the jockey pulley screws, and adjust the fan belts (page 5).

TIMING GEARS

The camshaft and fuel pump drive gears, which are an interference fit, are keyed to the shafts and secured by a bolt and washers and a nut and lock plate respectively. The idler gear is bushed and supported on a hub bolted to the crankcase front plate and has a lead-bronze faced steel thrust washer at the front and rear.



S 3073

Fig. 13. Crankcase front plate. The oil drillings for lubricating the timing gears and the idler gear hub are indicated by 1 and 2 respectively

Lubrication for the timing gears is provided through a small drilling in the crankcase front plate. A separate drilling which communicates with a drilling in the idler hub lubricates the idler gear bush and hub (Fig. 13).

Timing marks are provided on the crankshaft, camshaft and fuel pump drive gears (Fig. 14).

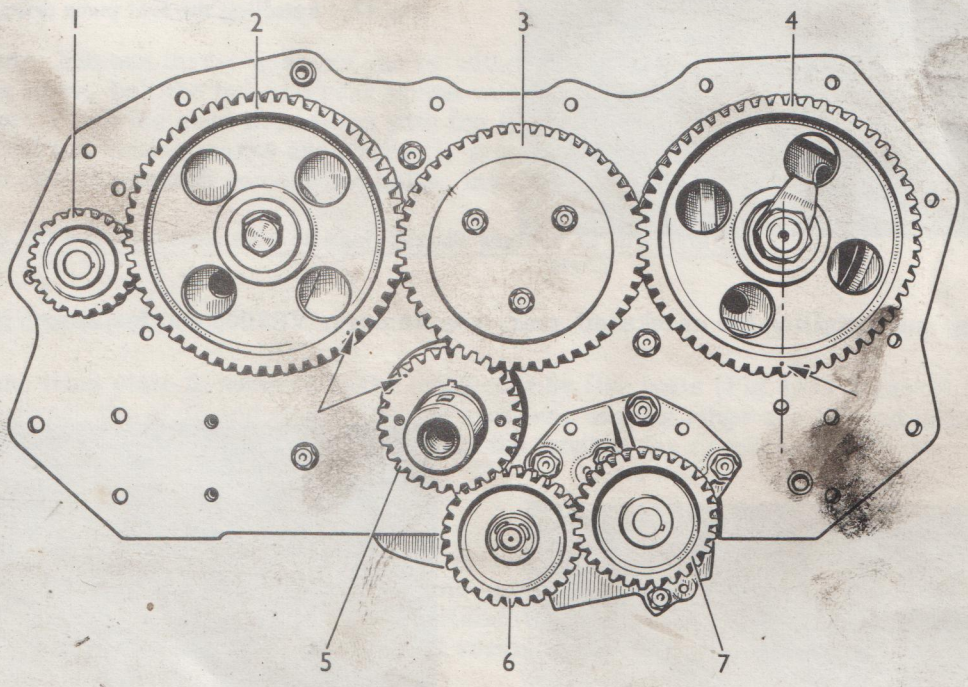


Fig. 14. Alignment of the timing gear marks. The mark on the fuel pump drive gear must be aligned with the centre of the bolt hole as indicated.
1. Power steering pump gear 2. Camshaft gear 3. Idler gear 4. Fuel pump drive gear 5. Crankshaft gear 6. Oil pump idler gear 7. Oil pump gear

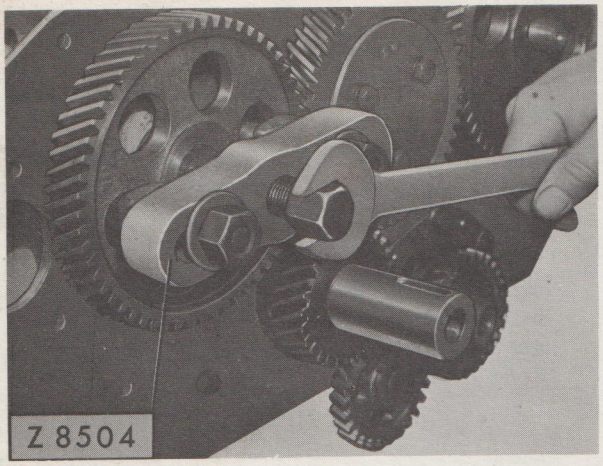


Fig. 15. Removing the camshaft gear. The fuel pump drive gear is removed in a similar manner

S 3074

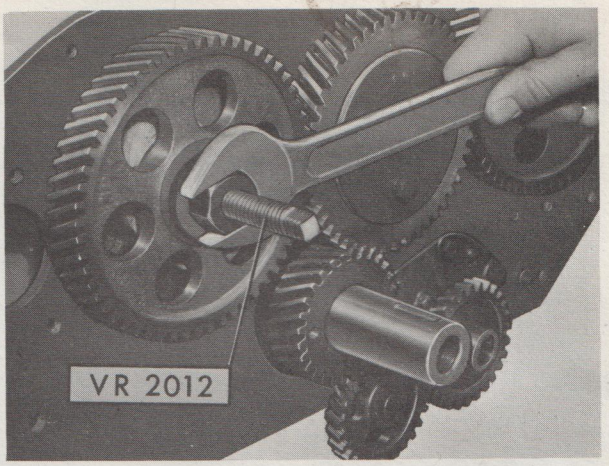
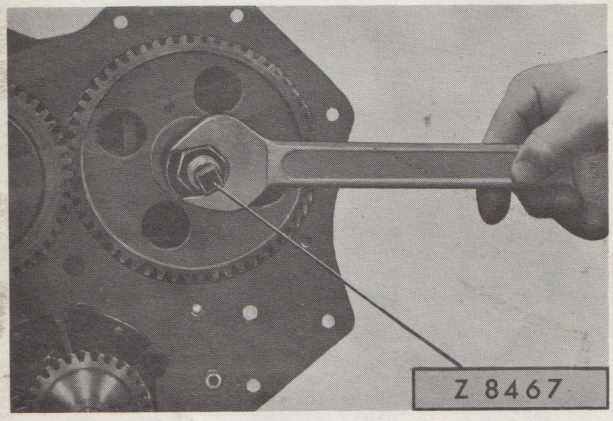


Fig. 16. Installing the camshaft gear

S 3075

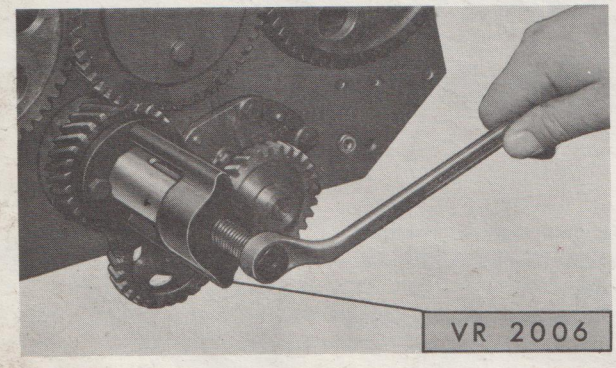
Use Drag Z. 8504 (Fig. 15) for removing the camshaft and fuel pump drive gears. When installing the gears ensure that the timing marks are correctly aligned (Fig. 14), and use Installer VR2012 for the camshaft gear (Fig. 16), and Installer Z. 8467 for the fuel pump drive gear (Fig. 17). Tighten the camshaft gear bolt and the fuel pump drive gear nut to the specified torque and secure the new lock plate on the latter.



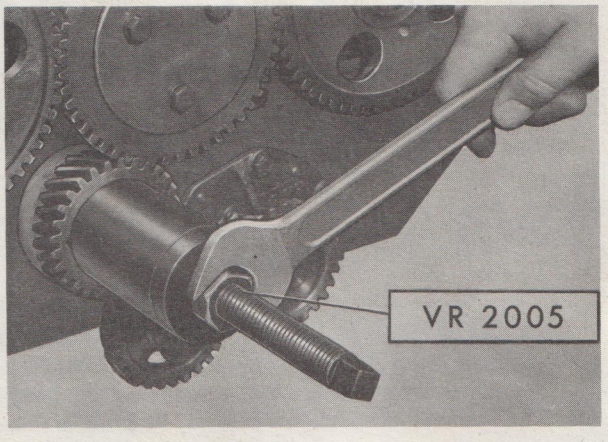
S 3076

Fig. 17. Installing the fuel pump drive gear

For removing and installing the crankshaft gear, use Remover VR2006 and Installer VR2005 (Fig. 18).



S 3077



S 3078

Fig. 18. Removing and installing the crankshaft gear

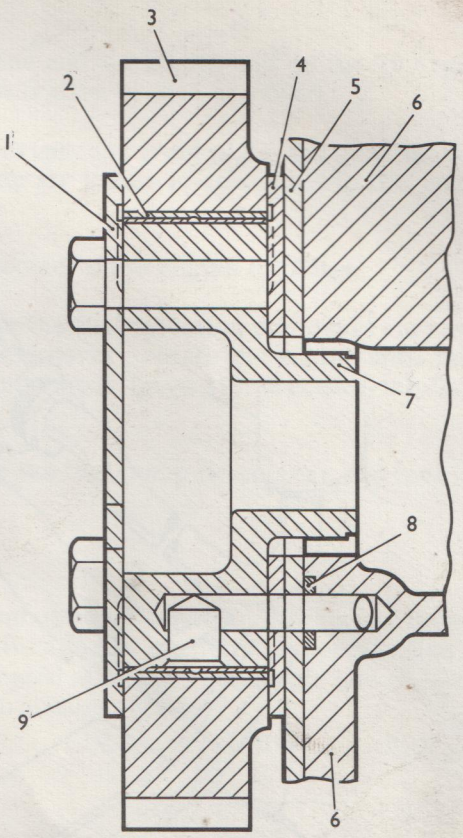


Fig.19. Idler gear and hub details
1. Front thrust washer
2. Gear bush
3. Idler gear
4. Rear thrust washer
5. Crankcase front plate
6. Crankcase
7. Idler gear hub
8. Sealing ring
9. Oil drilling

The idler gear, hub and thrust washers can be withdrawn after removing the three bolts. When installing the idler, bolt the hub and rear thrust washer temporarily in position without the front thrust washer. Place the gear in position with the spigotted side towards the rear thrust washer and ensure that the timing marks are correctly aligned on the remaining gears, then with the gear and hub still in position remove the bolts, install the front thrust washer and tighten the bolts.

NOTE: Make sure the slotted side of each thrust washer is towards the gear.

CRANKCASE FRONT PLATE

The crankcase front plate is secured to the crankcase by five bolts (Fig. 13). A gasket is interposed between the plate and crankcase and neoprene sealing rings are located in the two counterbores surrounding the oil feed drillings in the front of the crankcase.

Removal

After removing all the timing gears except the crankshaft gear, support the compressor or exhauster and remove the five bolts securing the unit to the front plate. Support the front of the engine and detach the engine front mountings. Remove the oil pump, power steering pump (where fitted), camshaft thrust plate and the five bolts securing the front plate to the crankcase and withdraw the plate.

Installation

Renew all gaskets and sealing rings, and refer to the information under the appropriate headings when installing the respective components.

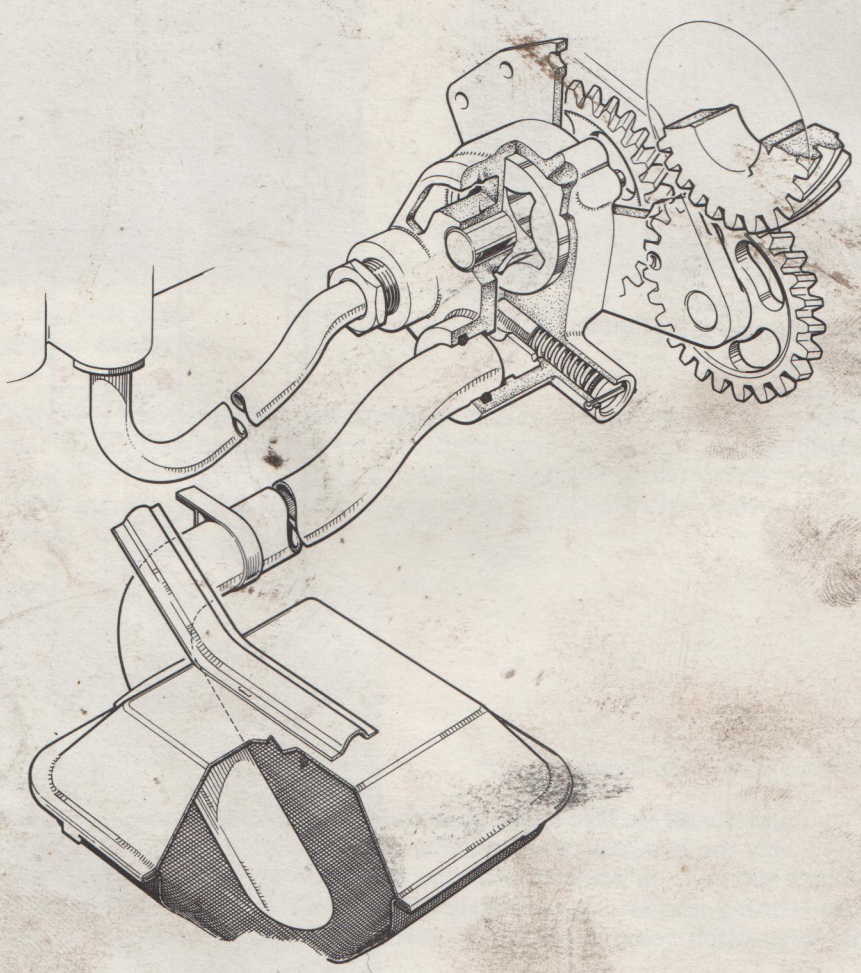


Fig.20. Oil pump and screen details

OIL PUMP

The internal lobe rotor type pump is dowelled and bolted to the crankcase front plate and driven at engine speed through an idler gear from the crankshaft gear. A spring-loaded plunger type relief valve is incorporated in the pump housing.

The pressure pipe is secured to the pump and oil filter drilling in the crankcase by conventional threaded unions but the suction pipe is a push fit in the pump body and sealed by a neoprene ring. The other end of the suction pipe is located through a neoprene ring in the oil pump screen cover and secured by a clip bolted to the crankcase. The screen cover is mounted on two brackets bolted to the crankcase.

When removing the pump the circlip must be removed from the pump idler gear shaft and the gear removed to gain access to one of the securing bolts. After disconnecting the pressure pipe and releasing the suction pipe clip, remove the securing bolts and withdraw the pump.

Renew the neoprene ring in the suction port before installing the pump.

AIR COMPRESSOR OR EXHAUSTER

A 6 cu. ft. compressor is provided on the 60 engine and a 9 cu. ft. unit on the 70 engine. An exhauster is available for vehicles where vacuum trailer brakes are used.

The compressor or exhauster is mounted on the crankcase front plate and gear driven from the crankshaft through an idler gear. The compressor air intake is connected to the engine air cleaner silencer.

Lubrication of the compressor is via a pipe connected to the engine oil filter.

To remove the compressor or exhauster, remove the fuel injection pump and carrier and disconnect the air and oil pipes. Remove the timing cover, rotate the engine until the timing marks are aligned (Fig. 14) and remove the fuel pump drive gear (page 12). Remove the five bolts and withdraw the compressor or exhauster.

Refer to the appropriate headings when installing the fuel pump drive gear and fuel injection pump.

PISTONS AND CONNECTING RODS

The pistons are aluminium alloy with toroidal combustion chambers offset away from the thrust side. Fully-floating piston pins are retained by circlips and each piston carries five piston rings. Three compression rings and one scraper are located above the piston pin and one scraper ring below. The top compression ring has an inlaid chromium section.

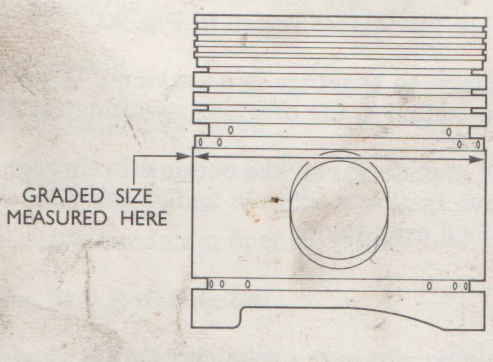


Fig.21. The piston graded size is measured at the diameter indicated and at right-angles to the piston pin

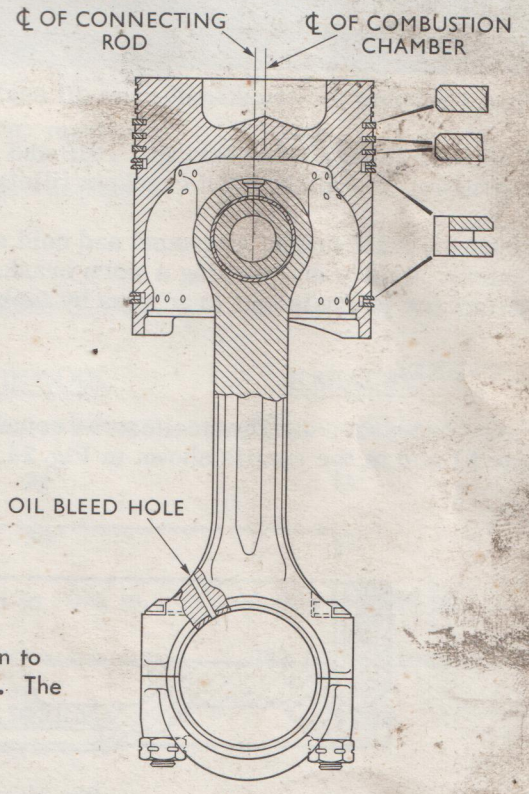


Fig.22. Correct assembly of piston to connecting rod and rings to piston. The top compression ring has an inlaid chromium section

The connecting rods have detachable shell-type bearings with caps secured by nuts and bolts. The piston pin bush is of lead-bronze and lubricated through a drilling in the top of the connecting rod, the rods are not drilled lengthwise.

Removal of the piston and connecting rod assemblies is conventional i. e. through the top of the bore. Correct assembly of the piston rings and piston to connecting rod is shown in Fig. 22. Oversize pistons of . 005, . 020 and . 040 in. are serviced in addition to cylinder liners.

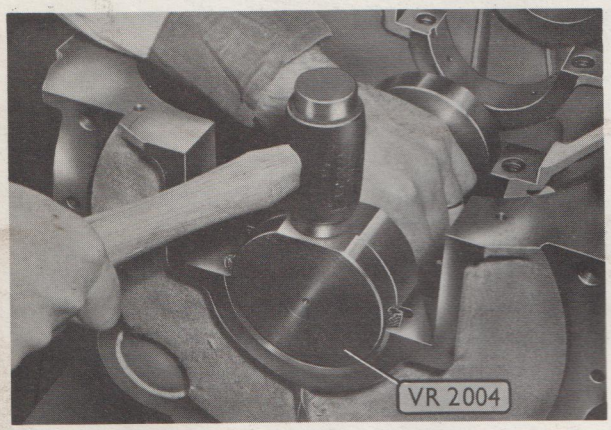
Install the pistons so that the combustion chamber is offset from the camshaft.

CRANKSHAFT AND BEARINGS

The crankshaft is supported by seven shell-type bearings and end float is controlled by thrust washers located each side of the centre bearing.

A two-piece oil seal contacts the crankshaft at the rear and a spring-loaded seal in the timing case contacts the crankshaft pulley hub.

The rear main bearing cap is extended to the same plane as the crankcase bottom face and cork seals are inserted between the sides of the cap and crankcase. In service, felt seals are used and inserted with Installer D1014. This does not apply to the front cap as the oil pan extends forward of the cap and is sealed to the bottom of the timing case.



S 3079

Fig.23. Installing the crankshaft rear oil seal

When renewing the crankshaft rear oil seal use Installer VR2004 as shown in Fig. 23.

In addition to standard bearings, .010 and .020 in. undersize bearings are serviced. After regrinding, the journal and crankpin fillets must be re-rolled to the original specification (Fig. 25).

Exchange crankshafts, reground and cold rolled by the manufacturer are obtainable through Main Dealers. Before despatching a worn crankshaft, remove the keys, dowels and clutch pilot bearing. Protect the journals and crankpins by taping old bearings over them.

FLYWHEEL

Where necessary the flywheel can be refaced by machining within the specified limits given on page 21 and to the details shown in Fig. 24.

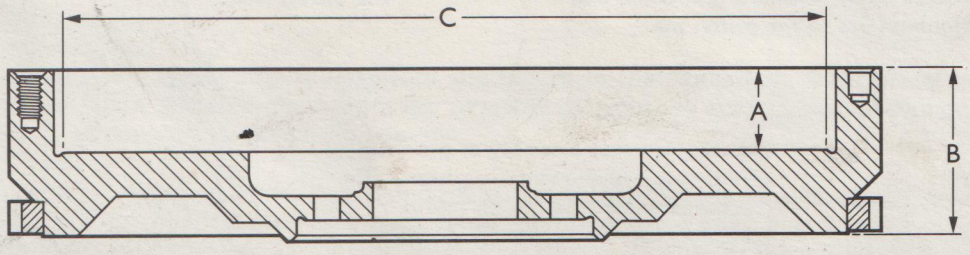


Fig.24. Flywheel machining data

It is important that dimension 'A' is maintained within the specified limits; therefore, after machining the friction face, a corresponding amount of material must be removed from the clutch mounting rim.

If dimension 'B' is reduced below the specified minimum, the flywheel must be renewed.

After refacing, check diameter 'C' and if necessary re-machine the .08 in. radius undercut to maintain this dimension.

SPECIFICATIONS

General Data

Firing Order	1, 5, 3, 6, 2, 4
Compression Ratio	17 to 1
Oil Capacity — Nominal	
Total — dry engine	23 Imp. pints ($27\frac{1}{2}$ U. S. pints)
Refill	21 Imp. pints ($25\frac{1}{4}$ U. S. pints)
Refill — with filter element change	$22\frac{1}{4}$ Imp. pints ($26\frac{3}{4}$ U. S. pints)

Cylinder Head and Valves

Cylinder Head	
Depth of head	3. 395 to 3. 405 in.
Depth after refacing	3. 385 in. minimum
Permissible distortion:	
Longitudinally	. 005 in. maximum
Transversely	. 003 in. maximum
Manifold attaching faces	. 003 in. maximum
Valve Timing	
Intake valve maximum opening point	108° after T. D. C.

Valve and Seat Refacing Data	INTAKE	EXHAUST
Valve head thickness	. 035 in. minimum	. 035 in. minimum
Valve angle	29°	44°
Seat angle	30°	45°
Seat width	. 054 to . 072 in.	. 088 to . 100 in.
Valve depth below head face	. 022 in. minimum	. 048 in. minimum
Valve Clearance — Hot	. 013 in.	. 013 in.
Valves		
Stem diameter:		
Standard	. 3410 to . 3417 in.	. 3397 to . 3407 in.
. 003 in. Oversize	. 3440 to . 3447 in.	. 3427 to . 3437 in.
. 006 in. Oversize	. 3470 to . 3477 in.	. 3457 to . 3467 in.

Valve Stem Diameter (Continued)	INTAKE	EXHAUST
.012 in. Oversize	.3530 to .3537 in.	.3517 to .3527 in.
.024 in. Oversize	.3650 to .3657 in.	.3637 to .3647 in.
Permissible stem clearance in bore	.005 in. maximum	006 in. maximum

Rockers and Shaft

Rocker clearance on shaft	.0009 to .0026 in.

Cylinder Block

Cylinder Block

Depth of block, top face to main bearing cap face	13.647 to 13.653 in.
Depth after refacing	13.637 in. minimum

Permissible distortion on top face:

Longitudinally	.005 in. maximum	.005 in. maximum
Transversely	.003 in. maximum	.003 in. maximum

Cylinder Liners (Service)	60 ENGINE	70 ENGINE
Cylinder Bore for Liner Installation	4.2675 to 4.2690 in.	4.7050 to 4.7065 in.
Maximum Piston Oversize for use with Liners	.020 in.	.020 in.

Pistons and Rings

Piston Pins

Fit in connecting rod bush	.0010 to .0017 in. clearance
Fit in piston bosses	Hard hand-push fit through each boss individually at a temperature of 18° to 24°C (65° to 75°F)

Piston Rings

Clearance in groove:

Top ring	.0025 to .0045 in.
Second and third rings	.0015 to .0035 in.
Scraper rings	.0015 to .0035 in.

Gap in cylinder bore:	60 ENGINE	70 ENGINE
Top ring	.021 to .035	.023 to .037 in.
Second and third rings	.017 to .031 in.	.018 to .032 in.
Scraper rings	.017 to .031 in.	.018 to .032 in.
Piston Clearance in Cylinder Bore	.0132 to .0142 in.	.0140 to .0150 in.

Piston Grades and Sizes

For production purposes four grades of piston are used, identified by a letter on the piston crown. These grades represent . 0005 in. sub-divisions of an overall size range of . 002 in.

For service, replacement standard and oversize pistons are of grades Y and W.

NOMINAL SIZE	GRADE	GRADED SIZE Measured at the top of the piston skirt and at right-angles to the piston pin (Fig. 21).	
		60 ENGINE	70 ENGINE
Standard	R	4. 1113 to 4. 1118 in.	4. 5480 to 4. 5485 in.
	B	4. 1118 to 4. 1123 in.	4. 5485 to 4. 5490 in.
	Y	4. 1123 to 4. 1128 in.	4. 5490 to 4. 5495 in.
	W	4. 1128 to 4. 1133 in.	4. 5495 to 4. 5500 in.
. 005 in. Oversize	Y	4. 1173 to 4. 1178 in.	4. 5540 to 4. 5545 in.
	W	4. 1178 to 4. 1183 in.	4. 5545 to 4. 5550 in.
. 020 in. Oversize (maximum for liners)	Y	4. 1323 to 4. 1328 in.	4. 5690 to 4. 5695 in.
	W	4. 1328 to 4. 1333 in.	4. 5695 to 4. 5700 in.
. 040 in. Oversize	Y	4. 1523 to 4. 1528 in.	4. 5890 to 4. 5895 in.
	W	4. 1528 to 4. 1533 in.	4. 5895 to 4. 5900 in.

Connecting Rods

Bearing Housing Bore	2. 6460 to 2. 6465 in.
End Float on Crankpin	. 008 to . 014 in.
Rod Alignment	Bush bore must be parallel with bearing housing bore in all planes

Crankshaft and Bearings

Crankpins	
Diameter	2. 4985 to 2. 4995 in.
Clearance in bearing	. 0020 to . 0040 in.
Main Journals	
Diameter	3. 4985 to 3. 4995 in.
Clearance in bearing	. 0020 to . 0045 in.
Crankshaft End Float	. 002 to . 012 in.

Thrust Washer Thickness

Standard	.091 to .093 in.
.003 in. oversize	.094 to .096 in.
.006 in. oversize	.097 to .099 in.
Main Bearing Housing Bore	3.666 to 3.667 in.
Service Main Bearing Cap Shim Thickness	.002 and .003 in.

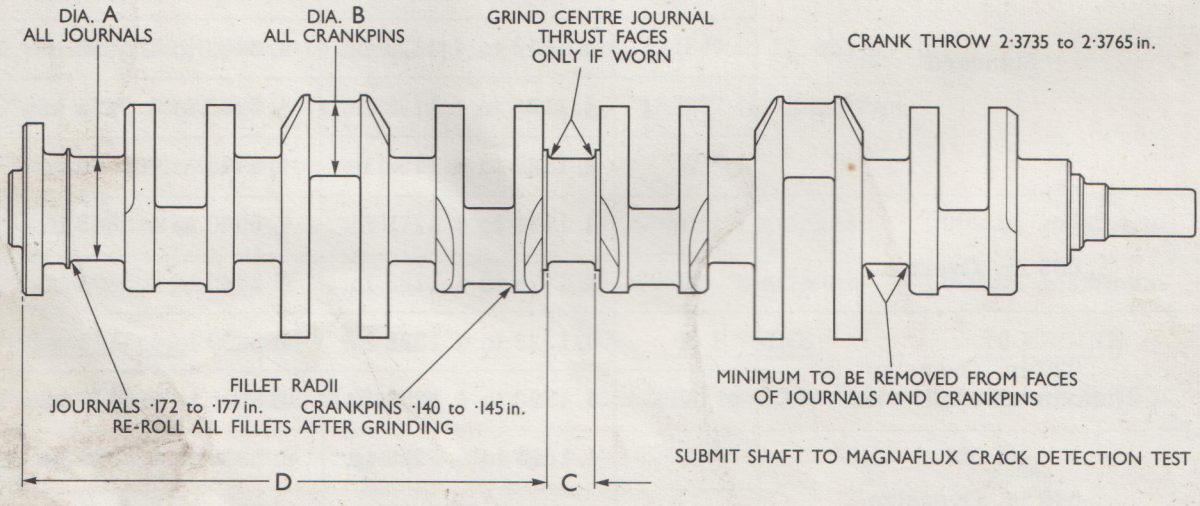


Fig.25. Crankshaft regrind data

Crankshaft Regrind Data (Fig. 25)

UNDERSIZE	DIA. 'A'	DIA. 'B'
.010 in.	3.4885 to 3.4895 in.	2.4885 to 2.4895 in.
.020 in.	3.4785 to 3.4795 in.	2.4785 to 2.4795 in.
THRUST WASHER OVERSIZE	DIM. 'C'	DIM. 'D'
.003 in.	1.940 to 1.944 in.	17.619 to 17.627 in.
.006 in.	1.946 to 1.950 in.	17.616 to 17.624 in.

It is important when regrinding the centre journal thrust faces that whatever dimension under 'C' is obtained, the corresponding dimension 'D' must be maintained. This is to ensure correct location of the crankshaft relative to the crankcase.

Camshaft and Bearings

Journal Diameter

No. 1 (front)	2.1360 to 2.1365 in.

No. 2	2.1140 to 2.1145 in.
No. 3	2.0910 to 2.0915 in.
No. 4	1.9730 to 1.9735 in.
Clearance in Bearings	.0025 to .0040 in.
Dimension from Cam Peak to Base	1.7973 in. minimum
Camshaft End Float	.002 to .012 in.

Flywheel

Dimensions after Refacing (Fig. 24) –	60 ENGINE	70 ENGINE
Dimension 'A'	1.479 to 1.503 in.	1.572 to 1.578 in.
Dimension 'B'	3.072 in. minimum	3.147 in. minimum
Diameter 'C'	14.00 in.	15.00 in.

Oil Filter

Element Type	AC 72

Fan Belts

Belt Tension	70 lb. (equivalent to .50 in. belt depression midway between crankshaft and jockey pulleys under load of 11 to 13 lb.)

Torque Wrench Data

Camshaft Gear Bolt	* 40 lb. ft.
Fuel Pump Drive Gear Nut	* 90 lb. ft.
Rocker Shaft Bracket Bolts	* 42 lb. ft.
Cylinder Head Nuts	* 105 lb. ft.
Cylinder Head Studs to Cylinder Block	* 50 lb. ft.
Connecting Rod Nuts	* 87 lb. ft.
Crankshaft Pulley Bolt or Starting Handle Dog	* 190 lb. ft.
Main Bearing Cap Bolts	+ 102 lb. ft.
Flywheel Housing Bolts	* 85 lb. ft.
Flywheel Bolts	* 77 lb. ft.

* Clean dry threads

\+ Bolt thread and head face coated with E. P. gear oil

FUEL SYSTEM

DESCRIPTION 22

WATER AND SEDIMENT TRAP 22

MAIN FUEL FILTER 23

HEAVY DUTY FILTRATION 24

AIR CLEANERS 24

COLD-STARTING AID 25

FUEL FEED PUMP 25

FUEL INJECTION PUMP – 60 ENGINE .. 26

FUEL INJECTION PUMP – 70 ENGINE .. 28

SPECIFICATIONS 31

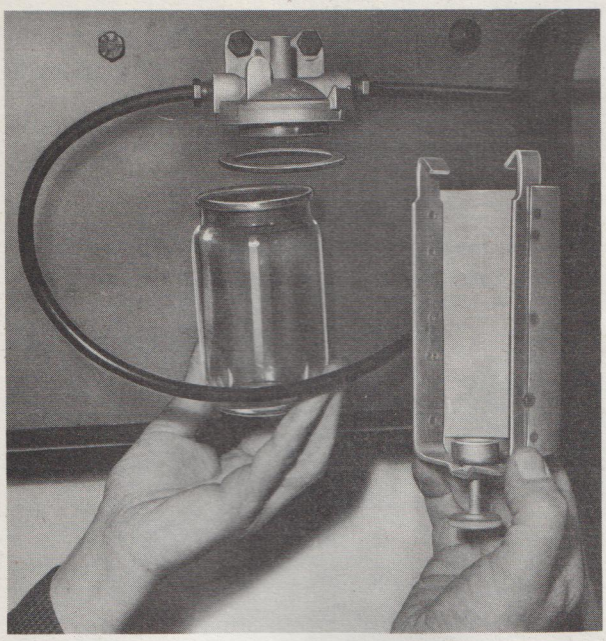
DESCRIPTION

The fuel injection pump is supplied by a conventional diaphragm type feed pump, a chassis-mounted water and sediment trap being connected between the fuel tank and the feed pump. Between the feed pump and the injection pump is an engine-mounted main fuel filter. On engines for which heavy duty filtration is specified, a C. A. V. twin-pack unit, comprising an agglomerator and a final filter, is provided.

The injection pump of the 60 engine is a C. A. V. mechanically governed DPA unit, a Simms Minimec pump being used on the 70 engine.

WATER AND SEDIMENT TRAP

The trap comprises a body incorporating a conical shield and a glass bowl secured to the body by a bail. A metal stone shield protects the glass bowl.



S 3080

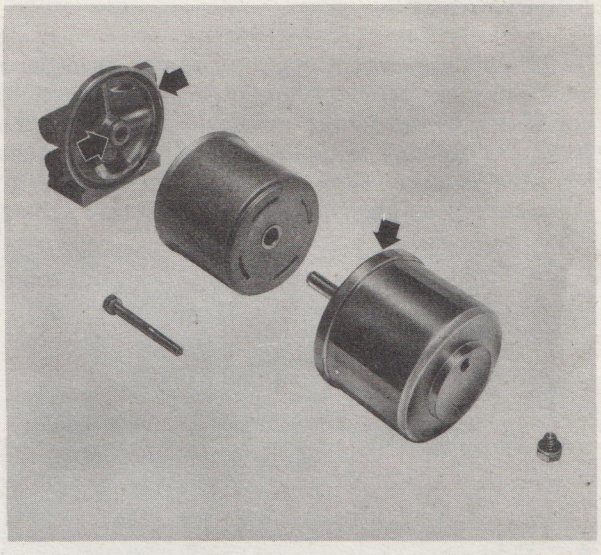
Fig.26. Stone shield and glass bowl detached from the water and sediment trap

Fuel enters the trap through a drilling in the centre of the conical shield and passes horizontally to the outer edge of the shield then upwards to the outlet drilling thus permitting water or sediment to sink to the bottom of the glass bowl.

When the bowl is installed after cleaning, prime and vent the fuel system up to the main filter.

MAIN FUEL FILTER

The filter comprises a filter head, paper type element and a detachable casing and sediment chamber which incorporates a drain plug. Inlet and outlet pipe connections, a blanking off plug and a union for the injector leak off pipe are provided in the filter head. In addition, on the 60 engine, a non-return valve is provided on the filter head. This valve permits the return of excess fuel from the fuel injection pump carrier to the filter and prevents a flow in the reverse direction.



S 3081

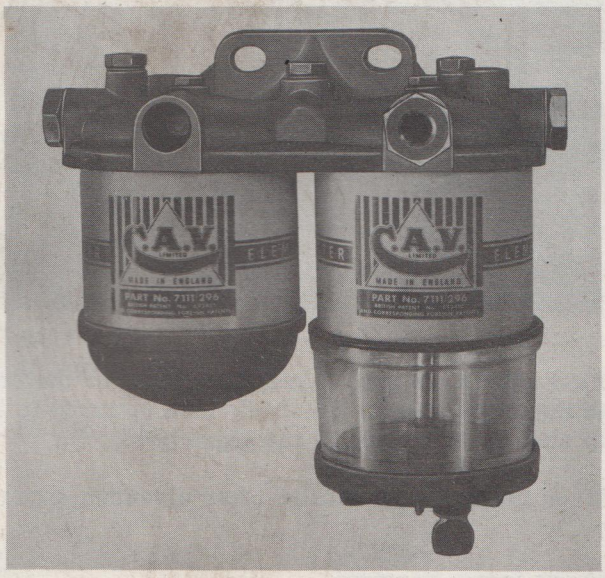
Fig.27. Main fuel filter details. The arrows indicate the sealing rings

As fuel passes through the paper element, water and foreign matter is extracted and sinks to the bottom of the sediment chamber.

Water and sediment is drained from the chamber by removing the drain plug. To gain access to the element, unscrew the retaining bolt on the filter head and withdraw the casing. After draining the chamber or renewing the element, prime and vent the system if necessary.

HEAVY DUTY FILTRATION

This is similar to the heavy duty system for 300 & 330 cu. in. Bedford diesels, except that a twin-pack unit is used i. e. both filters, the agglomerator and the final filter are mounted on a common filter head.



S 3082

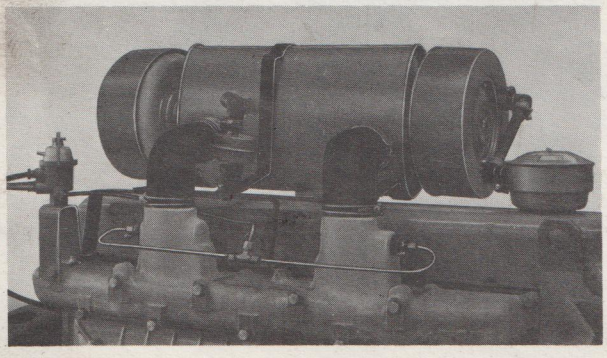
Fig.28. The twin-pack heavy duty filter

Remove the drain plug from the agglomerator filter to drain the glass bowl then replace the plug, and prime and vent the fuel system.

Release the retaining bolts on the filter head to remove and renew both filter elements. Clean the agglomerator bowl then prime and vent the fuel system.

AIR CLEANERS

On all models except coach chassis, twin paper element type air cleaners are secured (one each end) to an air silencer mounted on brackets attached to the cylinder head. The air silencer is connected to the intake manifold by two neoprene hoses. A hose from the unfiltered air side of the front air cleaner is connected to the crankcase breather in the rocker cover, and another hose from the air silencer is connected via an oil trap to the rocker cover. The air intake pipe for the compressor is also connected to the air silencer.



S-3083

Fig.29. Air cleaners and silencer assembly

On coach chassis, a single paper element type air cleaner is mounted forward of the engine on a bracket bolted to the body and is connected to the intake manifold by a 'Y' pipe and hoses. An air silencer is not incorporated.

When the air cleaner elements are cleaned or renewed, wash out the oil trap with paraffin also clean and re-oil the crankcase breather.

COLD-STARTING AID

This equipment comprises an igniter supply tank, two igniters and a switch. The tank and igniters are shown in Fig. 29.

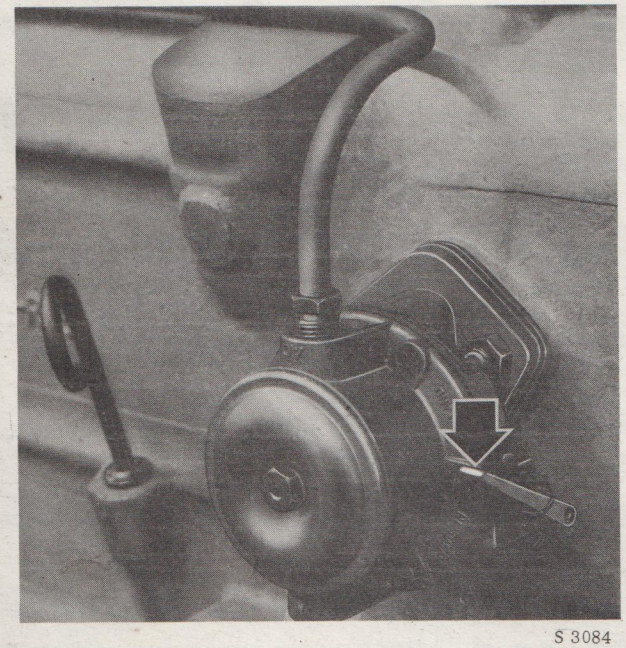
The igniter supply tank is attached to a bracket on the rear of the intake manifold and is supplied with fuel from the main fuel filter. A pipe from the igniter supply tank returns excess fuel to the fuel tank and another pipe connects the supply tank to the igniters. The supply tank is vented through a pipe from the tank bowl.

The igniters are screwed into the intake manifold and in addition to the igniter coils each contain a fuel ball-valve which is operated by a heater coil.

FUEL FEED PUMP

The spring-loaded diaphragm-type pump is mounted on the right-hand side of the crankcase and is operated by an eccentric on the camshaft. In addition to the operating diaphragm a pulsator diaphragm is incorporated and is interposed between the cover and pump body. The purpose of the pulsator is to smooth out fluctuations in the fuel delivery to the fuel injection pump.

A hand priming lever is provided on the side of the pump. The pump does not contain a gauze filter screen.



S 3084

Fig.30. Fuel pump with hand priming lever indicated by arrow

FUEL INJECTION PUMP – 60 ENGINE

The 60 engine is equipped with a DPA type fuel injection pump which is mechanically governed. The pump is flange mounted to a carrier attached to the compressor or exhauster. A bracket bolted to the underside of the carrier and to the crankcase, supports the rear end of the carrier.

The drive shaft coupling is keyed and clamped by a bolt and nut to the compressor or exhauster shaft and is splined at the rear end for engagement with the pump shaft splines. A master spline ensures correct timing relationship between the pump and coupling.

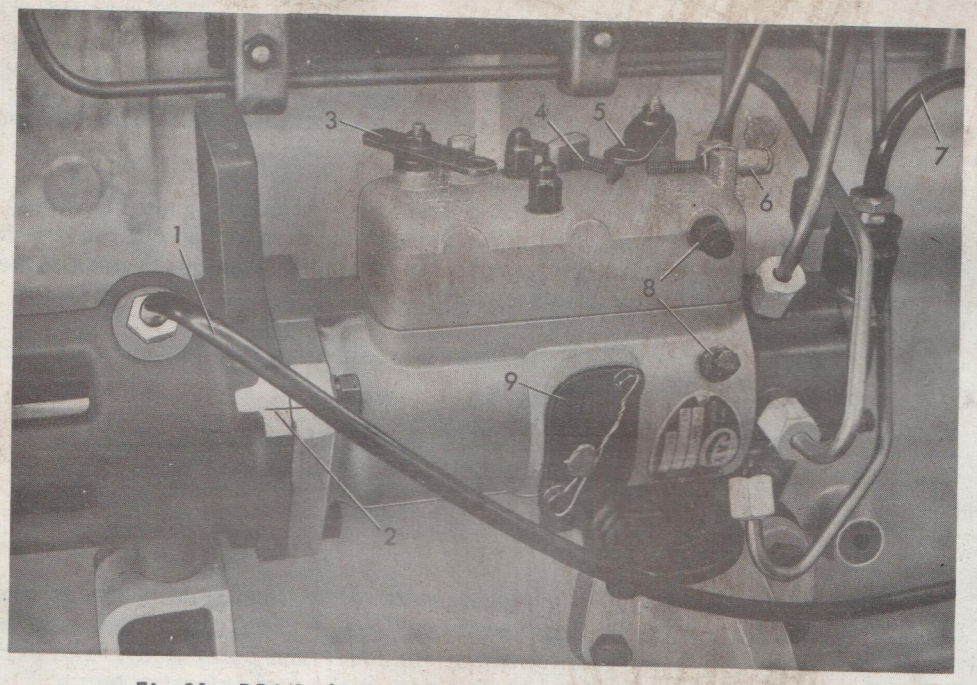


Fig.31. DPA fuel injection pump - 60 engine. S 3085
1. Excess fuel return pipe 2. Timing marks 3. Shut-off lever 4. Idling stop screw 5. Throttle control lever 6. Maximum speed stop screw 7. Fuel feed pipe 8. Vent screws 9. Cover plate

Leak-off fuel flows from the pump into the rear half of the carrier to lubricate the coupling and is retained in this area by a seal in the carrier which operates on the coupling. A pipe returns excess fuel from the carrier to the main fuel filter.

Priming and Venting

1. Slacken the plug in the unused outlet of the main filter also the vent screws on the injection pump hydraulic head and governor housing.

2. Ensure that the fuel feed pump rocker arm is contacting the base of the cam, enabling the full pumping stroke to be obtained with the priming lever.

3. Operate the feed pump priming lever and when fuel free from air flows from the outlet on the main filter tighten the plug while continuing to prime.

4. Continue priming until air-free fuel flows from the vent screw on the injection pump hydraulic head then tighten this screw.

5. There is no need to hand pump fuel through the vent on the governor housing and this should be left loose at this stage.

6. Slacken any two high pressure injection pipe unions, operate the starter and as soon as the engine runs, tighten the unions.

7. Finally, tighten the vent screw on the governor housing.

Idling Adjustment

The engine idling speed is controlled by a hexagon-head stop screw which contacts the throttle control lever on the governor housing (Fig. 31).

With the engine at normal operating temperature, check the idling speed with a tachometer. If necessary adjust the idling stop screw so that the engine idles at the specified speed.

On vehicles equipped with an idling control knob on the instrument panel ensure that the knob is screwed right in and that a small clearance exists between the nipple on the control wire and the throttle control lever, before adjusting the idling speed.

Maximum Speed Adjustment

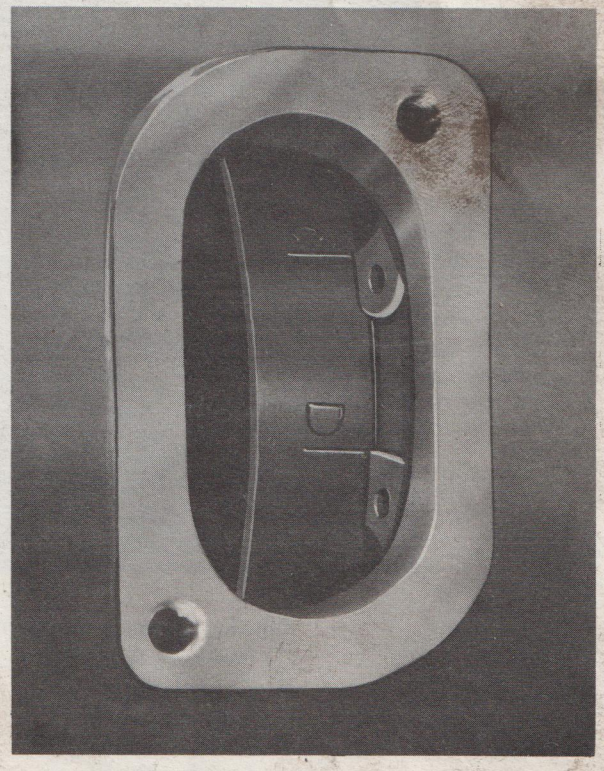
The engine maximum speed is set by a hexagon-head stop screw on the governor housing (Fig. 31). This screw is encased by a cover which is sealed against unauthorized interference.

With the engine running at normal operating temperature, move the throttle control lever on the governor housing by hand to the maximum speed position and check the engine speed with a tachometer. If the speed is not as specified, break the seal, remove the cover and adjust the screw. It is important that the specified maximum speed is not exceeded, therefore this adjustment must not be attempted without a tachometer. Install and seal the cover.

Pump Timing Check

To check the accuracy of the timing marks on the pump and carrier flanges, or after installing a new pump carrier, which would be unmarked, proceed as follows:

Remove the cover plate from the side of the pump. Rotate the engine until the flywheel timing mark (21° B. T. D. C.) is aligned with the timing aperture pointer and No. 1 cylinder is on compression stroke. Check that the timing mark 'D' on the pump rotor is aligned with the squared end of the circlip (Fig. 32).



S 3086

Fig.32. Timing mark 'D' on the pump rotor aligned with the squared end of the circlip

If necessary, adjust the position of the pump on the carrier and scribe a line on the carrier relative to the line on the pump flange.

Removal and Installation

Remove the fuel injection pipes and feed pipe and disconnect the controls from the pump. Remove the three nuts from the pump flange and withdraw the pump.

When installing the pump, ensure that the gasket is in position, rotate the pump shaft so that the master spline is in alignment with the master spline in the coupling then push the pump home. Align the timing marks on the pump mounting flange and the carrier (Fig. 31) and tighten the nuts. After installing the pipes, prime and vent the fuel system. Check the idling and maximum speeds.

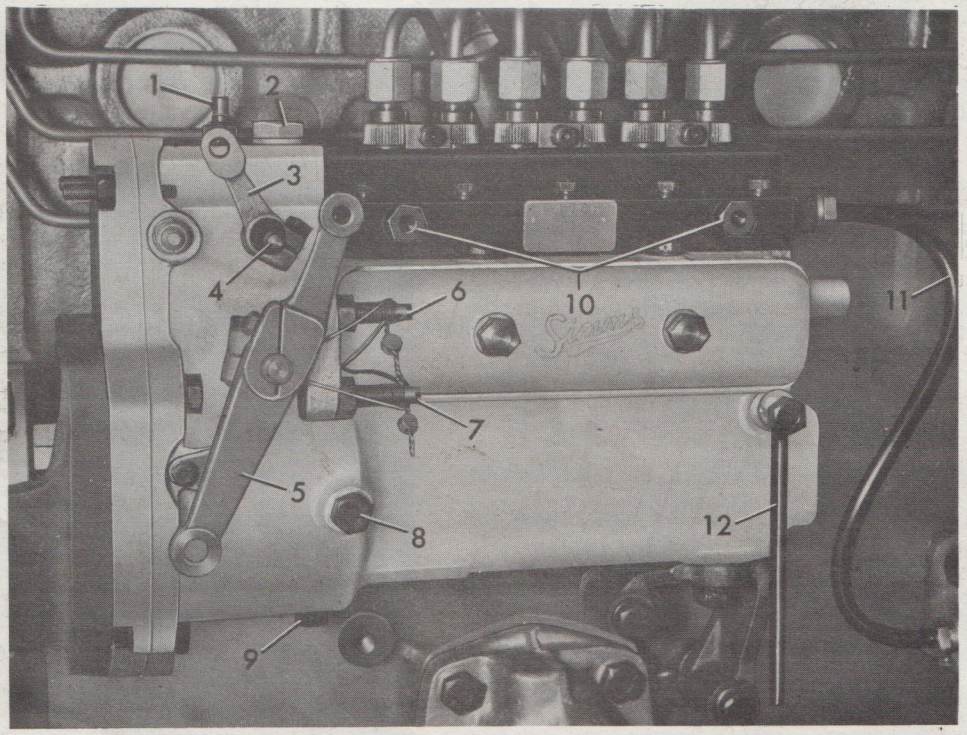
FUEL INJECTION PUMP – 70 ENGINE

The Simms Minimec pump is mechanically governed and flange mounted to a carrier attached to the compressor or exhauster. A rear support bracket is bolted to the underside of the pump and the crankcase. The pump is driven through a dog-type coupling.

An excess fuel device incorporated in the governor is operated by a plunger on the stop control lever shaft in conjunction with the governor speed control lever. To operate the device, move the governor speed control lever to the maximum speed position and depress the plunger. The plunger automatically releases after the engine has started.

Lubrication

The pump is lubricated by oil contained in the camshaft chamber. Oil filler, level and drain plugs are provided (Fig. 33). The oil should be changed every 6000 miles.



S 3087

Fig.33. Simms fuel injection pump - 70 engine

1. Maximum fuel stop
2. Oil filler plug
3. Stop control lever
4. Excess fuel plunger
5. Speed control lever
6. Idling stop screw
7. Maximum speed stop screw
8. Oil level plug
9. Oil drain plug
10. Vent plugs
11. Fuel feed pipe
12. Drain Tube

Priming and Venting

1. Slacken the plug in the unused outlet of the main filter.

2. Ensure that the fuel feed pump rocker arm is contacting the base of the cam, enabling the full pumping stroke to be obtained with the priming lever.

3. Operate the feed pump priming lever and when air-free fuel flows from the outlet on the main filter tighten the plug while continuing to prime.

4. Release the two vent plugs above the inspection cover on the fuel injection pump and continue priming until air-free fuel flows from both vents then tighten the plugs while still priming.

Idling Adjustment

The engine idling speed is controlled by a slotted stop screw which contacts the speed control lever on the governor housing (Fig. 33). The screw is sealed against unauthorized interference.

With the engine at normal operating temperature, check the idling speed with a tachometer. If necessary break the seal and adjust the idling stop screw so that the engine idles at the specified speed. Secure the screw with a new seal.

On vehicles equipped with an idling control knob on the instrument panel, ensure that the knob is screwed right in and that a small clearance exists between the nipple on the control wire and the speed control lever, before adjusting the idling speed.

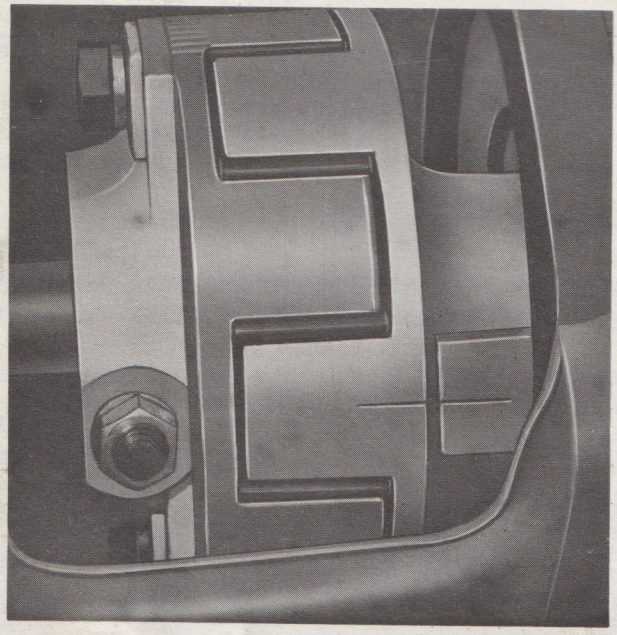
Maximum Speed Adjustment

The engine maximum speed is set by a slotted head stop screw which the speed control lever quadrant contacts. The screw is sealed against unauthorized interference.

With the engine running at normal operating temperature, move the speed control lever by hand to the maximum speed position and check the engine speed with a tachometer. If the speed is not as specified, break the seal and adjust the screw. It is important that the specified maximum speed is not exceeded, therefore this adjustment must not be attempted without a tachometer. Secure the screw with a new seal.

Pump Timing Check

Rotate the engine until the flywheel timing mark (26° B. T. D. C.) is aligned with the timing aperture pointer and No. 1 cylinder is on compression stroke. The timing mark on the pump coupling should be in line with the mark on the pump (Fig. 34). If necessary slacken the two bolts securing the coupling front flange and rotate the coupling to align the marks then retighten the bolts.



S 3088

Fig.34. Alignment of the spill timing marks on the pump coupling and timing pointer

Removal and Installation

Disconnect the fuel injection pipes and feed pipe and detach the controls from the pump. Remove the two bolts securing the pump to the rear support bracket and the three bolts securing the pump to the carrier and withdraw the pump. The coupling will part at the dogs.

When installing the pump, engage the pump coupling so that the locating bolt on the driving flange of the coupling enters the hole in the pump coupling flange. Tighten the bolts securing the pump to the carrier before tightening the support bracket bolts to the specified torque. Check and if necessary reset the pump timing. After installing the pipes, prime and vent the fuel system.

SPECIFICATIONS

Fuel Feed Pump	
Make and Type	AC Delco VP
Delivery Pressure	5 to 8 lb/sq. in.
Main Fuel Filter	
Make and Type	AC Delco AD510
Element Type	ACD 51
Heavy Duty Filter	
Make and Type	C. A. V. 2 FAS 5845190
Element Type	7111/296
Fuel Injection Pump – 60 Engine	
Make and Type	C. A. V. DPA 3263280
Engine Governed Speed	
Idling	550 r. p. m.
Maximum – no load	2800 r. p. m.
Pump Timing (start of injection)	21° B. T. D. C. (timing mark on flywheel)
Fuel Injection Pump – 70 Engine	
Make and Type	Simms P. 4796
Mechanical Governor	
Make and Type	Simms SPGE 61785S250/1500
Camshaft End Float	. 002 to . 005 in.
Coupling End Clearance (between rubber insert and coupling)	. 020 in.
Phasing	
Travel from bottom of stroke to inlet port closure (No. 1 plunger)	2. 4 to 2. 6 mm.
Plunger head clearance (all)	1. 5 mm.
Plunger vertical end float (all)	. 05 to . 20 mm.
Intervals between spill cut off	60° $\pm \frac{1}{2}$°

Engine Governed Speed		
Idling	550 r. p. m.	
Maximum — no load	2800 r. p. m.	
Spill Timing	26° B. T. D. C. (timing mark on flywheel)	
Injectors	60 ENGINE	70 ENGINE
Make and Type	C. A. V. Multi-hole	Simms N1299
Nozzle Holder	BKBL. 87S5153	HB 875628
Nozzle	BDLL. 160S6492	NL 478
Seat angle	59° 25'	58° 30'
Spray holes		
Number	4	4
Diameter	.3 mm.	.3 mm.
Nozzle Valve		
Seat angle	60°	60°
Valve lift	.3 mm.	.15 to .25 mm.
Testing and Setting Data		
Back leakage	Pressure to drop from 150 to 100 atmospheres on gauge at temperature of 10 to 20°C (50 to 70°F) in not less than 6 seconds	
Delivery Pressure	175 atmospheres	
Seat tightness	Nozzle tip to be substantially dry at sustained pressure of 165 atmospheres	
Spray form	Sprays to be of equal form and completely atomised at 90 injections per minute	
Torque Wrench Data		
Injector Securing Nuts	* 6 lb. ft.	
Delivery Valve Holders (Simms pump)	* 32 lb. ft.	
Fuel Injection Pipe Unions	Finger tight plus 1/3 turn with wrench	
Coupling to Injection Pump Nut (Simms pump)	* 46 lb. ft.	
Injection Pump to Support Bracket Bolts (Simms pump)	* 15 lb. ft.	

* Clean dry threads

RECOMMENDED LUBRICANTS - OVERSEAS

Usage	SAE Viscosity Number	Specification
Engine Above 32°C (90°F) 32 to -12°C (90 to 10°F) Below – 12°C (10°F)	 30 20 10W	MIL–L–2104A Supplement 1
Crankcase Breather	50	GM 4752–M
Camshaft Cams and Tappets Oil Pump Spindle and Relief Valve Piston Pins Valve Stems	—	Mineral oil containing colloidal graphite
Crankshaft Rear Oil Seal	—	Paste of heavy mineral oil with 25% by weight of molybdenum disulphide
Clutch Pilot Bearing Water Pump Bearings Main Drive Pinion Splines	—	GM 4616–M or 4617–M
Water Pump Seal	—	Castor oil base grease, harmless to rubber
Clutch Fork Ball Clutch Release Levers, Pins and Struts Transmission Front Cover Sleeve	—	GM 4530–M

RECOMMENDED LUBRICANTS - UNITED KINGDOM

Usage	BP	Castrol	Duckham's	Esso	Gulf	Mobil	Petrofina	Regent	Shell
Engine	Vanellus 20 W	Castrol CR 20 or Deusol CR1 SAE 20	NOL Diesel HD 20/1	Essofleet HDX 20	Gulflube Motor Oil HD 20/20W	Delvac 1120	Fina Delta Motor Oil SAE 20W/20	Super RPM Delo Special SAE 20	Rotella T 20/20W
	We also approve the appropriate Multigrade oil (of Supplement 1 type), marketed by the above Companies								
Crankcase Breather	Energol SAE 50	Castrol Grand Prix	NOL 50	Essolube 40/50	Gulflube 50	Mobiloil BB	Fina Pontonic WA SAE 90	Havoline 50	Shell X-100 50
Camshaft Cams and Tappets Oil Pump Spindle and Relief Valve Piston Pins Valve Stems	Acheson's Oildag								
Crankshaft Rear Oil Seal	Rocol Anti-scuffing Paste or Croda Grease GP/G 6591								
Clutch Pilot Bearing Water Pump Bearings Main Drive Pinion Splines	Energrease L. 2	Castrolease LM	LB. 10 Grease	Esso Multi-purpose Grease H	Gulflex A	Mobil-grease MP	Fina Marson HTL 2	Marfak Multi-purpose 2	Retinax A
Water Pump Seal	——	Castrol No. 3 Rubber Grease	Q 4590 Rubber Grease	TSD 803 Grease	—	———	—	—	—
Clutch Fork Ball Clutch Release Levers, Pins and Struts Transmission Front Cover Sleeve	Energrease C. 3G or Energrease L 21 M	Castrolease Brake Cable Grease or Castrolease MS 3	G. G. Grease or LBM. 10 Grease	Esso Graphite Grease or Esso MP Grease (Moly)	Gulfsil Grease G, G7/8 G or Gulflex Moly	Mobil-grease Special	Fina Marson LM 2	Regent Grease 904	Retinax AM

Description	Tool No.	Remarks
Reverse Flushing Gun	D1022	
Valve Guide		
Reamer (.003 in. o/s)	Z8500	
Reamer (.006 in. o/s)	Z8501	
Reamer (.012 in. o/s)	Z8502	
Valve Rocker Adjuster	D1031	

SERVICE

Printed in England
Imprimé en Angleterre